Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Correlation of the Formations Described in the Fort Apache Region in Arizona with Similar Formations in Other Parts of the State.

ALBERT B. REAGAN.

On page 152 of Professional Paper 98-K of the U. S. Geological Survey, Dr. Frederick Leslie Ransome says, in speaking of my work in the Canyon creek section[1] (Arizona), that attempts to identify in my published sections the formations discriminated in the Roosevelt and Grand Canyon sections have met with little success.[2]

As my field work as well as Gilbert's was done before anything much was really known of the geology of that part of Arizona, the sedimentary rocks were mapped and described in groups, as it then appeared impracticable to map them in as great detail as has since proved possible in the Ray quadrangle, for instance. Furthermore, on account of the advanced knowledge of the geology of the entire region, certain peculiar formations which were then difficult to identify can now be readily placed by comparing them with stratagraphic work in other sections.

The following sections of the Palæozoic strata of Arizona from Mexico to the Grand Canyon have been made:[3] Bisbee,[4] Tombstone,[5] Clifton,[6] Globe and Ray Quadrangles,[7] Roosevelt,[8] Southern,[9] Part of the Sierra Ancha,[10] Northern Part of the Sierra Ancha,[11] Head of Canyon Creek,[12] Jerome region,[13] and Grand Canyon.[14]

By a comparison of these sections it is easily seen that Gilbert did not see the entire Cambrian series at Canyon creek and that his Tonto Sandstone, as with my sections, is the upper part of the series. His section at the head of Canyon creek was often visited by the writer, and from appearance all he examined at this point was the Dripping Spring quartzite and the Barnes conglomerate; the rest of the series is wanting at this point and the Dripping Spring quartzite is in itself not its full thickness. Gilbert's section is on the crest of the east and west older pre-cambrian ridge that underlies the Palæozoic here and now extends as the surface rock from near Ellison P. O. westward through the Tonto basin, covering a region from five to fifteen miles wide. In mapping the formation the writer followed Gilbert and considered the formation below the Barnes conglomerate as Algonkian. But in the light of later investigations it is the lower part of the Cambrian series and is included in the Tonto group of Noble's Grand Canyon section. Several miles down Canyon creek from where Gilbert took his measurements the Pioneer shale comes to view beneath the Barnes conglomerate. The

---

1. Reagan, A. B., Geology of the Fort Apache region in Arizona. Am. Geologist, vol. 32, pp. 265-308, 1903.
2. Ransome, Professional Paper 98-K of the U. S. Geological Survey, p. 152.
3. Ransome, Professional Paper 98-K, plate XXV.
4. Ransome, F. L., U. S. Geological Survey, Paper 21, 1904.
5. Ransome, F. L., from unpublished data.
6. After Lingren, W., U. S. Geological Survey, Folio 129, 1905.
7. Ransome, F. L., Washington Academy of Sciences Journal, vol. 5, pp. 380-388, 1915.
8. Ransome, F. L., from unpublished data.
9. Ransome, F. L., from unpublished data.
10. Ransome, F. L., from unpublished data.
11. Gilbert, G. K., Wheeler Survev, vol. 3, pp. 163-164, 1875.
12. Ransome, F. L., from unpublished data.
13. Based chiefly on work of L. F. Noble, U. S. Geological Survey, Bulletin 509, plate X, 1914.

writer's Algonkian formation includes the Pioneer shale and the Scanlon conglomerate and the Tapeats sandstone which lies between the shale and the conglomerate in a few places. It should also be added that as one approaches the Sierra Ancha the Tonto group undergoes slight changes and many variations are noticed which only careful study of detail work will straighten out. The writer's Tonto Sandstone group in the Apache mountains is the Apache group of the Globe quadrangle with the addition of the Troy quartzite and Mescal limestone, all of which are Cambrian in age. Carboniferous and Devonian rocks also occur in the Apache mountains but were not mapped, though their presence is noted in the Nantan Mountains.

In correlation, the Apache group in the Globe quadrangle, from base up, includes the Scanlan conglomerate, Pioneer shale, Barnes conglomerate and Dripping Spring quartzite. Devonian and Carboniferous limestone were also mapped in that region, as the "Globe limestone" along with which was mapped the Mescal limestone in many places. The Abrigo limestone of Bisbee and Tombstone is an equivalent of the Longfellow formation of Clifton, the Mescal limestone of the Globe-Ray quadrangle and at Roosevelt and in the southern part of the Sierra Ancha (the Troy quartzite of the Globe-Ray region—400 feet thick—is the white quartzite—8 feet thick—at the top of the Abrigo at Bisbee), and the Mauv limestone (formerly included in the Tonto shale) and the Bright Angel shale together of the Grand Canyon section. In this paper it will be considered as the Mescal limestone. The Tapeats or Tonto quartzite (sandstone) is an equivalent of the Bolsa quartzite of the Bisbee and Tombstone sections, the Coronado quartzite of Clifton, the Dripping Spring quartzite (or the Dripping Spring quartzite, Barnes conglomerate, Pioneer shale and Scanlan conglomerate) of the Globe-Ray quadrangle and Roosevelt region and the southern part of the Sierra Ancha.[14] Below is my section "From Farmer's residence on Cibicu to Salt Springs on Salt river, near its confluence with Canyon creek,"[15] compared with the "Globe and Ray quadrangles."[16]

Section from Farmer's residence on Cibicu to Salt Springs on Salt river near its confluence with Canyon creek.	Section from the Globe and Ray quadrangles.
UPPER RED WALL GROUP (NOW SUPAI). 1. Alternating limestone and sandstone (*Productus cora, Spirifer, cameratus, Calamites cannaeformis*). 60 to 120 feet. 2. Millstone grit. calcareous sandstone shaly to massive. 20 feet.	TORNADO LIMESTONE. 1,000 feet. Thick beds of light-gray limestone. Fossils scarce in lower or Mississippian portion, but plentiful in the Pennsylvanian portion. No recognizable plane of division between Mississippian and Pennsylvanian.
LOWER RED WALL GROUP (NOW RED WALL). 3. Alternating gray limestone and shale varying in color from black to red (*Orthis pornata, Orthis livia, Spirifer fornicula. S. striatus, S. preëxtensus. S. Plenus, Orthonata paralleta. Lithostration californiense, Chonetes dalmania*). 400 feet.	

---

[14] See Ransome, F. L., Professional Paper 98-K of the U. S. Geological Survey, pp. 143, and 164-166, and plate XXV.

[15] Reagan, A. B., Geology of the Fort Apache region in Arizona. Am. Geologist, vol. 32, pp. 273-274.

[16] Ransome, F. L., loc. cit., plate XXV.

DEVONIAN (NOW MARTIN LIMESTONE). 4. Alternating chert and flint strata. 40 feet. 5. Massive light colored marbled limestone (*Acervularia davidsoni abundant*). 35 feet. 6. Stratum of grit rock. 15 feet.	MARTIN LIMESTONE. 325 feet. Generally pebbly cross-bedded quartz-upper half. Gritty base. Shale at top.
SILURIAN. 7. Red to brown fossiliferous limestone (*Orthis davidsoni, Strombodes pentagouis*). 65 feet.	
TONTO FORMATION. 8. Massive to shaly, brown to red, coarse, cross-bedded vitreous sandstone. 600 feet. 9. Red, cleavage-jointed shales. 40 feet. 10. Gray to red sandstone, falling apart in angular blocks. 70 feet.	APACHE GROUP. TROY QUARTZITE. 400 feet. Generally pebbly cross-bedded quartzite with lenses of conglomerate. Shaly, rusty beds with worm casts at top.
11. Marbles, limestone (marbled limestone). 70 feet.	Vesicular basalt flow. 25-75 feet. MESCAL LIMESTONE. 225 feet. Thin, varicolored, more or less dolomite beds with cherty layers.
12. Vitreous to soft, red purple, green and white sandstone and shale, a conglomerate completing the series. 150 feet.	DRIPPING SPRING QUARTZITE. 450 feet. Fine-grained varicolored arkosic quartzite, much of it with dark red and gray banding partings between the beds not distinct. Ripple marks. BARNES CONGLOMERATE. 10-55 feet.
13. Hornblende biotite granite and olivine diabase (intrusive) and dioryte (a sill). 120 feet. 14. Vitreous, soft, red, purple, green and white sandstone and shale. 300 feet.	PIONEER SHALE. 150 feet. Maroon shale, arkosic and quartzite near base.
15. Conglomerate. 10 feet. Great unconformity.	SCANLON CONGLOMERATE. 0-15 feet. Great unconformity.
ARCHÆAN. 16. Gneiss. 100 feet. 17. Granite and allied rocks. 600 feet.	OLDER PRE-CAMBRIAN.

The correlation shows that the formations of the Globe and Ray quadrangles and those of Canyon creek are identical.

ALBERT B. REAGAN,
Ex-principal of the Southern Ute Boarding School, Ignacia, Colo.
March 15, 1918.